OUR ASTRONOMICAL COLUMN.

EPHEMERIS FOR COMET 1905 *a*.—A set of elements and a daily ephemeris for comet 1905 *a* are given in No. 4011 of the *Astronomische Nachrichten*. The ephemeris has been computed by Herr M. Ebell, and an extract is given below :—

Ephemeris 12h. (M.T. Berlin).

1905	α (true) h. m. s.	δ (true) ° ′	log r	log Δ	Brightness
May 12	9 45 27	+49 15·8	0·1066	9·9814	0·42
16	10 8 56	+49 44·2	0·1172	0·0002	0·36
20	10 31 29	+49 51·5	0·1281	0·0189	0·32
24	10 52 58	+49 40·1	0·1394	0·0375	0·28
28	11 13 11	+49 13·1	0·1508	0·0558	0·24
June 1	11 32 9	+48 32·8	0·1623	0·0740	0·21
5	11 49 51	+47 41·8	0·1739	0·0919	0·18

COMETS 1905 II (1904 *e*) AND 1904 I.—A daily ephemeris for comet 1904 *e*, computed by Dr Strömgren, is given in No. 4011 of the *Astronomische Nachrichten*. The comet is now very faint, and as seen by Dr. Palisa at the beginning of April it was 10″ in diameter, and had a fourteenth-magnitude nucleus. During the present month it will apparently travel through the constellation Lynx in a south-easterly direction towards Leo Minor.

A bi-daily ephemeris for comet 1904 I, computed by Herren Nijland and van d Bilt, is given in the same journal. This comet is also faint, being 0·052 as bright as when first discovered, its magnitude then being about 9·0. It is likewise situated in the constellation Lynx, and is apparently travelling in a S.S.E. direction towards Cancer, although at the beginning of September it will only be about 3° south of 35 Lyncis.

OBSERVATIONS OF JUPITER.—The results of their observations of Jupiter during the 1904–5 opposition are given by MM. Flammarion and Benoit in the May number of the *Bulletin de la Société astronomique de France*. Numerous points of change in the colours and forms of the various features are noted, and some of them are illustrated on the four drawings accompanying the article. Among the other conclusions derived from these observations the writers state the following :—(1) the estimations of the coloration of the equatorial bands do not confirm Mr. Stanley Williams's views as to periodical changes therein; (2) the appearance of the Great Red Spot has not changed since the previous opposition; (3) the large variation of the longitude of this feature between March and June, 1904, was probably due to the passage alongside it of the dark region of the tropical zone; (4) a clear spot situated in longitude 0° of system ii., and dividing the south equatorial band, appears to be a permanent feature which it will be well to observe assiduously. They further urge that careful attention should be paid at the end of this year to observations of the movements of the red spot, of the bright spots on the southern edge of south temperate band announced by Mr. Denning, and of the dark region situated in the south tropical zone.

THE ELECTRIC CHARGE OF THE SUN.—In No. 1, vol. x., of *Terrestrial Magnetism and Atmospheric Electricity* is reprinted the address "On the Electric Charge of the Sun" delivered by Prof. Svante Arrhenius before the International Electrical Congress held at St. Louis last September.

After briefly discussing the various theories regarding the nature of the sun's repulsive action, the author shows that the theory which explains the phenomena, by premising that the repulsion is due to radiation pressure acting on negatively charged particles, is in accordance with observational records. The particles having a specific weight of 1·0 and a radius of 0·08 μ are those which are repelled at the greatest speed, and would reach our atmosphere in about 45·9 hours, an interval of the same order as that obtained by Riccò for the time intervening between the probably correlated solar and terrestrial phenomena. These particles are negatively charged in accordance with Mr. C. T. R. Wilson's proof that such particles are more easily condensed on negative than on positive ions, the ionisation of the solar atmosphere resulting, as Lenard has shown, from the action of the sun's strong ultra-violet radiation. By a simple calculation Prof. Arrhenius shows that the remaining positive charge is balanced, and the balance maintained, by the attraction of negative electrons emitted by other celestial bodies which are negatively charged and lose their charge under the influence of their ultra-violet rays. All such rays coming within a mean distance of 0·063 light-years of the sun will be attracted thereto, and by this means the supply of negative electrons becomes just proportional to the defect thereof.

VARIABILITY OF MINOR PLANET (15), EUNOMIA.—*Circular* No. 94 of the Harvard College Observatory is devoted to an account of Prof. Wendell's observations of the minor planet Eunomia, from which he established a variation of magnitude of about 0·5. The observations were made with a photometer having achromatic prisms and attached to the 15-inch telescope. As the planet was near its stationary point it was compared with the same star, +13° 1875 (mag. 9·0), from March 15 to April 1, and the corrected differences varied from −0·77 to −1·11. The formula J.D. 2416920·116+0·1267 E. expresses the phase and period of the changes. The period is very similar to that found for minor planet (7), Iris, viz. 0·1295d., and in both cases it is still doubtful as to whether the period requires doubling or not.

FAINTNESS OF PLANETARY NEBULÆ.—Some interesting results of calculations appertaining to the luminosity of the surfaces of several planetary nebulæ, as compared with the surface luminosity of the sun or the moon, are given in a letter written by Mr. J. E. Gore to the current number of the *Observatory*.

Dealing with the nebula H, iv. 37, situated near to the pole of the ecliptic, he finds that the ratio of its surface luminosity is to that of the sun's as $1:43196{\cdot}7\times10^6$. The similar ratios for the nebulæ h 3365, Σ 5, and G.C. 7027 are $1:245{\cdot}3\times10^6$, $1:1095{\cdot}5\times10^6$, and $1:434\times10^6$ respectively; thus the brightest of them, *i.e.* h 3365, has a surface luminosity of only 1/400 that of the moon.

THE COWTHORPE OAK.

IN the *Transactions and Proceedings of the Botanical Society of Edinburgh* (vol. xxii., part iii., 1904, p. 396) we notice a very interesting article on the Cowthorpe Oak from the pen of Mr. John Clayton. This venerable tree, which stands near the church of Cowthorpe, a small village near Wetherby, is unique among oaks in that its girth is greater than that of any other known tree of its species. Recorded measurements taken about 1700 show that it had at that time a height of 80 feet with a girth of 78 feet on the ground. Since then various observers have recorded its dimensions and noted at the same time the gradual process of decay, damage by storm, and other points likely to be of interest. The latest measurements were taken by Mr. Clayton himself, and they show that the height is now reduced to 37 feet including dead wood, while the girth on the ground has diminished to 54 feet 3 inches. In 1893 a crop of acorns was produced, from one of which a seedling was reared, and is now planted near its parent as a memorial.

The tree stands in a warm, sheltered spot in a field which has a gentle slope to the river, and near enough to get a constant supply of water. The process of decay has been going on for the last 200 years. Between 1703 and 1722 much damage was done by various storms; nevertheless, new leaves are put forth annually. The acorns produced in 1893 were on long stalks—hence the species is *Quercus pedunculata*. As regards the age of this giant opinion seems to differ. The trunk, being now hollow, precludes all possibility of ever ascertaining the number of year-rings, and no trustworthy data are available before the year 1700—hence the author has been compelled to rely upon a comparison with the age of other trees. In a tree the duration of life may be taken as composed of

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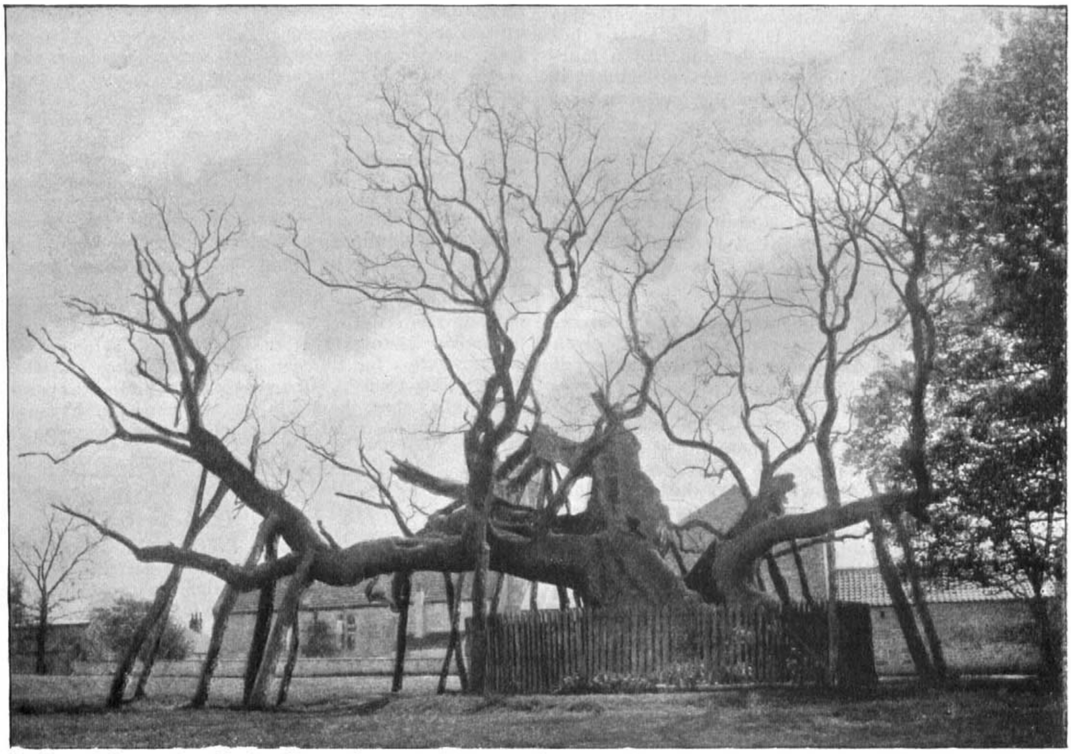
three periods, one of growth, one of maturity, and lastly one of decline and decay. Between the number of years in each period a certain ratio is found to exist, and, taking this as a basis, together with what is known of the tree since 1700, Mr. Clayton arrives at the conclusion that its age is not more than 500 years—certainly much nearer the mark than the age of 1600 years assigned to it by Prof. Burnett in 1842, who based his calculation on the theory of the elder De Candolle that a tree increases by one-twelfth of an inch in diameter annually, an altogether untrustworthy basis of calculation.

There is quite a number of other interesting historical trees dealt with in the article, for example, the Greendale Oak in Welbeck Park, which belongs to the Duke of Portland. Its height was recorded by John Evelyn in 1846 as 88 feet, while the altitude of the highest twig at the present day is only 54 feet. In 1724 a roadway was cut through the trunk, which girths 30 feet 1 inch at 4½ feet from the ground. The height of the archway was then 10 feet 2 inches, but recent measurements show that the highest point is now only 9 feet 3 inches, and the lowest 8 feet 6 inches. This shows conclusively that a subsidence of the trunk must have taken place within the last 200 years, and, by assuming that a similar sinking into the ground has occurred in the case of the Cowthorpe Oak, Mr. Clayton explains the apparent discrepancies between the earliest and latest recorded girth dimensions of the veteran. The trunk being somewhat tapering, the diameter naturally lessens as the sinking in proceeds. Mr. Clayton adds a note on the testimony of a Cowthorpe man named Oates, who said, "The tree has shrunk very much in my time, and in shrinking the tree has twisted—the Eastern branches towards the South."



Cowthorpe Oak, seen from North. The tree is supported by twenty-five props, disposed mostly on the South and East sides. There is a paling about 5 ft. high, which seems as if it had been put up from twenty to forty years ago.

Another notable tree as regards size and age is the Crowhurst Yew, which girths 34 feet 4 inches on the ground. It stands in the churchyard of that place. The church must be very old, as it contains monuments of Saxon and Norman workmanship. The author points out that the oldest trees are usually in close proximity to a sacred edifice, such as this yew and the Cowthorpe Oak, and the association no doubt affords them protection.

Another notable veteran is the great chestnut of Tortworth, Gloucester, which girths 49 feet 2 inches at 4 feet from the ground. It also stands about 100 yards from a very old and beautiful church.

As regards the longevity of trees, the theory was promulgated at the beginning of the nineteenth century by De Candolle that the duration of life in trees was practically unlimited, neglecting accidents due to unfavourable external conditions, such as the ravages of parasites, injuries from storms, lightning, and other causes. Passing in review the vegetable kingdom, we find there are some lowly organised plants, such as certain algæ and fungi, the whole life cycle of which may be completed within the short space of a few days, or even hours. Among the higher plants we have annuals and biennials the existence of which terminates with the production of seed. Then we have the agave and certain palms, the aërial portions of which may live from ten to forty years until the production of flower and fruit terminates their span of life, their place being taken by new aërial portions developed from lateral buds at the base of the plant. In the case of trees and woody shrubs, on the other hand, new growing points are formed annually, but this vegetative process does not end in the production of flower and fruit, so that, excluding accidents, there is no reason why that vegetative process should not be continued for an unlimited time.

The giant Wellingtonias of California are well known examples of the age and dimensions which trees may attain. A stem in the British Museum shows 1330 year-rings with a diameter of about 15 feet. On the other hand, certain Japanese dwarf trees are known to be of very great antiquity, although lacking the size of the Wellingtonias. At the same time, one must not lose sight of the fact that the living cells are continually being renewed, and that in a tree like the Cowthorpe Oak the living parts are at most but a few years old.

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